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| **TEAM Lesson Plan Template** | |
| Teacher: Andrew Morency | |
| Subject/Grade: High School Biology 1 | |
| Lesson Title: Constructing chromatin | |
| **STANDARDS** | **Identify what you intend to teach.** State, Common Core, ACT College Readiness Standards and/or State Competencies; Enduring Understandings and Essential Questions. |
| BIO1.LS1.4 Demonstrate how DNA sequence information is decoded through transcriptional and translational processes within the cell in order to synthesize proteins. Examine the relationship of structure and function of various types of RNA and the importance of this relationship in these processes  This lesson emphasizes:  Science practice: Developing and using models  CCC: Scale  Learning performance: Students will construct a model of DNA and use it to demonstrate how DNA coils and compresses to fit within the cell highlighting the CCC of scale. | |
| **OBJECTIVE(s)/Sub-Objectives** | **Connect prior learning to new learning.** Clear, Specific, Observable, Demanding, High Quality, Measurable, Aligned to Standard(s), and Integrated with other subjects, build on prior student knowledge  Student-Friendly (I Can Statement) |
| I can construct a model of chromatin.  I know the difference between chromatin and a chromosome. | |
| **MATERIALS AND RESOURCES** | **Content-related:** Clearly supports lesson objective(s); rigorous & relevant; Incorporates multimedia & resources beyond the textbook. |
| **Activities & Materials**  \_x\_ Whiteboard/markers or Computer/projector/Smartboard  \_x\_ Colored dough (Playdough), a shoebox or other small box  \_x\_Internet Resource <https://www.youtube.com/watch?v=9kQpYdCnU14> (watch maybe at .75 speed with subtitles)  slideshow <https://www.pbs.org/wgbh/nova/genome/dna_flash.html>  **Routine for distributing materials** Pass out cans of dough so that each pair of students gets two different colors. | |
| **ACCOMMODATIONS/ADAPTATIONS** | **Learning styles and interests.** Anticipate learning difficulties, regularly incorporate student interests & cultural heritage; differentiate instructional methods. |
| **Modifications/Plans for Diverse Learners *(NOTE: Clearly identify where you will use each of these in your lesson; do not just check the box!)***  **Differentiation**  **----- Content**  **----- Process**  **----- Product**  **----- Tiered Assignments**  **----- Flexible Grouping**  **----- Learning Centers \_\_\_\_ Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Accommodations**  **\_\_\_ Preferential Seating \_\_\_ Extended Time \_\_\_ Small Group \_\_\_ Peer Tutoring**  **\_\_\_ Modified Assignments \_\_\_ Other**  **Early Finishers:** | |

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| **MOTIVATING STUDENTS/ANTICIPATORY SET** | **“Hook”: Engage students’ attention and focus on learning.** Personally meaningful and relevant. |
| Remind students that we want to be able to separate the dough into its original colors at the end of the activity. Do not squeeze different colors completely together.  Review the concept of scale at <https://scaleofuniverse.com/>  Show the video at <https://www.youtube.com/watch?v=9kQpYdCnU14> at 75% speed with subtitles on.  Show the slideshow <https://www.pbs.org/wgbh/nova/genome/dna_flash.html>  Requires the Flash Player. Try starting from DNA and moving outward, that is, go to the end of the slideshow and work backward. | |
| **INSTRUCTIONAL PROCEDURES** | **Step-by-Step Procedures-Lesson Sequence: Basic to Complex.** Lesson includes visuals, modeling, logical sequencing and segmenting (beginning, middle, ending); essential information; concise communication; grouping strategies; differentiated instructional strategies to provide intervention & extension; seamless routines; varied instructional strategies; key concepts & ideas highlighted regularly. |
| ***Introductio*n*.***  What is the difference between chromatin and a chromosome?  Arrange students in pairs. Pass out cans of dough so that each pair has two distinct colors of dough.  Demonstrate how to take 1/3 of the playdough and form a thin-diameter strand approximately 2 feet long. Demonstrate how to use another color to form small balls. Remind students again that we want to be able to separate the dough into its original colors at the end of the activity. Do not squeeze different colors completely together.  Middle:  Have students open their cans of dough and make strands and balls. Ask students how many feet of playdough they would have if each strand were laid end to end in a line [ 25 to 50 feet ]  Demonstrate how to wrap the strand of dough around each ball about 1.5 times. Have students wrap their strands.  Have students draw their strands and label their drawing with “histone” and “nucleosome.” Use the questions below from the Knowledge section.  Demonstrate how these beads on a string can be coiled again to represent a small portion of chromatin. Have the students coil their chromatin. Have students draw their coiled strand and label it “chromatin.”  End:  Have one student from each pair carry the pair’s chromatin to the front of the room and stack these strands of chromatin. Ask students to recall the total length of their uncoiled strands. Place the stack of strands from the whole class in a small box to show how densely the DNA is now packed.  Ask the class: We have just used another model of DNA. What does this model emphasize? [ compaction of DNA ] What are some details that this model ignores [ almost all of them ].  Have the chromatin carrier from each group retrieve the chromatin. Have each pair of students unravel their chromatin and return the correct colors of dough to the correct cans. Have them pass in the cans or return the cans to a designated location.  **Motivating Students**  \_x\_ Verbal Reinforcement Encourage students as they create their models  \_x\_ Relate to Real World Everybody loves playdough  **Presenting Instructional Content**  \_x\_ Lecture/Notes A brief lecture at the beginning reminds students of DNA’s structure. A video and/or slideshow help students see the coiling of DNA so that it fits in the nucleus.  \_x\_ Hands-on. This is a hands-on activity to appreciate how tightly DNA compresses information.  ***Instructional strategies:***  **Modeling and Guided Practice *–*** The teacher will model (pedagogical verb) each step of rolling, wrapping, and coiling the dough model (SEP noun) of DNA  **Check for Understanding (CFU) –**  ***What am I doing for students that progress at different rates?***  ***What do I do if they get it?***  ***What do I do if they don’t get it?*** | |
| **QUESTIONING/THINKING/PROBLEM SOLVING (embedded throughout)** | **Balanced mix of question types.** Utilizes Blooms Taxonomy/Webb’s Depth of Knowledge; high frequency; purposeful & coherent; require active responses; balance based on volunteers/non-volunteers, ability, & gender; lead to further inquiry & self-directed learning.  **Implement four types of thinking (Analytical, Practical, Creative, & Research-based) & Teach/Reinforce problem-solving types**. Provide opportunities for students to generate ideas & alternatives; analyze, evaluate & explain information from multiple perspectives& viewpoints. |
| **Questioning**  **Knowledge:**  What are the components of a DNA molecule [deoxyribose (sugar), phosphate group, nitrogenous base ]  What do we call the proteins around which DNA wraps? [ histones ]  What do we call the resulting structure with DNA wraps around a histone? [a nucleosome]  What do we call a collection of nucleosomes? [chromatin ]  **Comprehension:**  What in our playdough model represents a histone?  What in our playdough model represents a nucleosome?  What is the difference between a chromosome and chromatin?  **Application:**  **Analysis:**  What features of DNA does this model ignore?  What was the point of using this model?  **Synthesis:**  What features of DNA does this model represent well?  **Evaluation:**  **Thinking*(NOTE: Clearly identify where you will use each of these in your lesson; do not just check the box!)***    \_x\_ **Practical** – Using playdough without squashing the colors together is a real-world challenge  \_x\_ **Creative**– Students get to choose which of their colors to use for a strand vs which color for the balls.  \_x\_ **Analytical** – Students compare the original total length of the strands to the resulting size of the coiled chromatin.  **\*What am I going to do to give Ss opportunity to?**  **1. Generate variety of ideas:**  **2. Analyze problems from multiple viewpoints:**  **Problem Solving**  **\_x\_ Abstraction** Students have to imagine the total length of all the strands that they make. They do not actually assemble the strands into a single linear piece.  **\_x\_\_ Categorization** Students have to categorize parts of their models as representing histones, nucleosomes, and chromatin.  **\_x\_\_ Identifying Relevant/Irrelevant Information** Students are asked which features of DNA are ignored in this model, that is, which are not relevant. | |

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| **GROUPING** | **Maximize student understanding & learning** Varied group composition (race, gender, ability, & age); clearly understood roles, responsibilities & group work expectations; accountability for group & individual work; student opportunities for goal setting, reflection & evaluation of learning. |
| * Have students work in pairs. * Both students will roll playdough. One student from each pair will take chromatin to the front of the room. * Tell partners on the left or front in each pair to be the designated carrier to go to the front of the room. * Students begin class seated with their partners. * Each group produces a playdough model of chromatin. | |
| **ASSESSMENT** | **Formative and/or summative assessment.** A variety of assessments, including rubrics, measure achievement of objectives and informs instruction. |
| ***Assessments: aligned with state stds; measurement criteria; measure student performance in more than 2 ways (project, experiment, presentation, essay, short answer, multiple choice test) (NOTE: Clearly identify where you will use each of these in your lesson; do not just check the box!)***  **\_\_\_ ThinkLink Probe \_\_\_ Study Island \_\_\_ Teacher Made Test \_\_\_ Unit/Chapter Test \_\_\_ Project \_\_\_ Quiz**  **\_\_\_ Group Assignment \_\_\_ Study Guide \_\_\_ Oral Presentation \_\_\_ Graphic Organizer \_\_\_ Exit Ticket**  **\_\_\_ Journal \_\_\_ Questions/Answers**  **\_\_\_Teacher Observation *(thumbs up/thumbs down, etc.)*\_\_\_ Solution to Real World Problem**  **\_\_\_ Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  *\****Students should achieve \_\_\_\_\_% mastery of this objective: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | |
| **CLOSURE** | **Reflection/Wrap Up.** Summarizing, reminding, reflecting, restarting, connecting. |
| ***During the conclusion part of creating an effective lesson plan teachers must sum up the ideas learned from the lesson. A teacher should also relate this information to future and past coursework to provide students with a broad understanding of the ideas learned. It is important to allow students enough time to ask questions, assert assumptions, and summarize the lesson during this part of the lesson plan.***   * ***Review/Summary: wrap up what has been learned and accomplished in the lesson (even if they are in the middle of an exercise, it is still important to summarize to the point where they are now). Ideally involve students in this synthesis.*** * ***Preview for next lesson: link what they did to day with where they are going next.*** * ***Upcoming assignments: remind them of any upcoming assignments.***   ***Here is your exit ticket for today…..***  **Follow-up Activities/Extension *These may be designed to create a longer or more intense lesson. For example, if the class is able to cover the material in a lesson much faster than expected, extensions may prove helpful. Extensions may also be useful in various parts of a lesson where the teacher (and class) decides they should spend more time on a skill or topic.***  ***Reflection: You must reflect on every lesson you teach.*** | |

**NOTES:**

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